Illinois Environmental Protection Agency · 1701 First Avenue, Maywood, IL 60153

[redacted]

708/531-5900

Date: April 3, 1992

To: Michael Hills, Permit Section, DAPC

From: Frederick L. Smith

Subject: Meyer Steel Drum, Inc.: Chicago: Stack Test Evaluation: Drum Reclamation Process with Afterburner Control: 031 600 APY: 91040073 MYERTEST.VOC

Meyer Steel Drum, Inc. retained Williams & Wentink as their environmental consultant, who in turn contracted with Mostardi-Platt to conduct VOC and particulate matter emissions from a new Drum Reclamation a process which is controlled by a thermal afterburner. The testing was conducted on December 12 & 13, 1991. Four tests were conducted. Test number 1 was not acceptable to the Agency due to higher than normal incinerator operating conditions. A fourth test was run and a total of three tests (Nos. 2-4) were submitted in the final report to demonstrate compliance.

Method 25 was employed to measure the VOC emissions after the thermal afterburner control. The procedure measures total gaseous non-methane organics. The particulate matter content of the exhaust gas stream was determined using Methods 1-5. Opacity of the exhaust stack was measured using Method 9.

The process includes a Winterbrother Furnace DRF-1 equipped with a waste heat boiler. The control device is a thermal afterburner which is gas fired. A total of 1335 drums were fed into the process during the three test runs. This calculates to 373 drums/hour. Each drum is estimated to weigh 43 pounds and the average residue per drum is 4.4 pounds. This works out to be a process weight rate of 17680 pounds/hour. The allowable particulate matter emissions are contained in Rule 212.321. VOC emissions are subject to Rule 218.301 which limits the organic emissions to 8 pounds/hour. The opacity readings observed during testing should be below 20 %.

Emission levels found during the testing and reported in the final report are as follows:

	Test 2	Test 3	Test 4
VOC Emissions: lbs/hr	2.50	3.21	2.49
Particulate Matter Emissions: lbs/hr	2.45	3.23	2.85
Allowable VOC:lbs/hr	8.0	8.0	8.0
Allowable Particulate:lbs/hr	7.59	8.47	8.13

An analysis of the particulate matter emissions is attached. The values compare favorably with the results contained in the final report. VOC calculations were carried out in a proper fashion. Sampling appears to have been done according to the procedures in 40 CFR 60, Appendix A. Also, the opacity readings noted during the testing are within limits and the afterburner was operated at 1400-1600F during sampling. The ash generated goes to a landfill. It is recommended the results contained in the final report be accepted as valid.

c.c. Miles Zamco: FOS Springfield
Cesary Krzymowski: Region 1
Lawrence Eastep: DLPC

Meyer Steel Drum, Inc.
Method 25 - TGNMO Results Summary
Afterburner Stack
December 12 and 13, 1991

Test No.	Date	Time	Air Flow (DSCFM)	Temp. (°F)	TGNMO Concentration (mg/m^3)	TGNMO Concentration (lbs/hr)
2	12/12/91	1315-1415	31,755	554.5	21	2.50
3	12/12/91	1500-1600	31,806	558.6	27	3.21
4	12/13/91	0730-0830	31,704	541.3	21	2.49
Average			31,755	551.5	23	2.73

$$\text{Emission Rate (lbs/hr)} = \frac{\text{TGNMO Conc. } (mg/m^3)}{1000\ (l/m^3)} \times \frac{6.24 \times 10^{-5}\ \text{lbs/dscf}}{mg/l} \times \text{DSCFM} \times 60\ \frac{\text{min}}{\text{hr.}}$$

MOSTARDI-PLATT ASSOCIATES, INC.

PARTICULATE TEST RESULTS SUMMARY				
Plant: Meyer Steel Drum, Inc.		**Source: Afterburner Stack**		
Test Run Number	2	3	4	Average
Test Location	Stack	Stack	Stack	
Source Condition	Normal	Normal	Normal	
Date	12/12/91	12/12/91	12/13/91	
Time	1300-1424	1500-1605	0729-0835	
Particulate Concentration:				
@ Flue Conditions, grains/acf	0.0043	0.0056	0.0051	0.0050
@ Standard Conditions, grains/dscf	0.0090	0.0118	0.0105	0.0104
Emission Rate:				
pounds/hour	2.45	3.23	2.85	2.84
Average Gas Volumetric Flow Rate:				
@ Flue Conditions, acfm	66,182	67,185	65,005	66,124
@ Standard Conditions, dscfm	31,755	31,806	31,704	31,755
Average Gas Temperature, °F	554.5	558.6	541.3	551.5
Average Gas Velocity, ft/sec	63.85	64.82	62.71	63.79
Flue Gas Moisture, percent by volume	5.64	6.52	5.72	5.96
Average Flue Pressure, in. Hg	29.23	29.23	29.35	
Barometric Pressure, in. Hg	29.23	29.23	29.35	
Average $\%CO_2$ by volume, dry basis	1.60	2.10	1.90	
Average $\%O_2$ by volume, dry basis	19.00	18.40	18.40	
Dry Molecular Wt. of Gas, lb/lb-mole	29.016	29.072	29.040	
Gas Sample Volume, dscf	45.539	36.657	38.513	
Isokinetic Variance	1.01	1.02	1.03	

FLSPART

Company Name: Meyer Steel Drum

Location: Chicago

Test Number: 2

Test Date: 12/12/91

Source: Drum Reclamation Process Controlled by an Afterburner

Identification Number: 031 600 APY

Application Number: 91040073

PARTICULATE MATTER TEST
Concentration & Pollutant Mass Rate

Vwc = Vl x 0.04707
Vwc = 57.8 x 0.04707
Vwc = 2.72 scf

VmStd = Y X Vm X (TsStd/Tm) X (Pb + DH/13.6)/PsStd
VmStd = 1.012 X 46.63 X (528/ 536.6) X (29.23 + 1.663 /13.6)/29.92
VmStd = 45.55 scf

Bwo = Vwc/VmStd +Vwc
Bwo = 2.720646 / 45.55221 + 2.720646
BWO = 0.0564
% H2O = 5.64
1-Bwo = 0.9436

Ms = Md(1-Bwo) + 18(Bwo)
Ms = 29.016 (.9436402) + 18(5.635975E-02)
Ms = 28.40

Vs = 85.48 X Cp X (Ts/Ps X Ms) Sq Rt X Dp
Vs = 85.48 X .84 X (1014.5 /(29.23 X 28.39514)) Sq Rt X .8042
Vs = 63.84 feet per second

Qs = As X Vs X 60
Qs = 17.176 X 63.84069 X 60
Qs = 65792 acfm

QsStd = Qs X (Ps/PsStd) X (TsStd/Ts) X (1-Bwo)
QsStd = 65791.66 X (29.23 /29.92) X (529/ 1014.5) X (1- 5.635975E-02)
QsStd = 31566 scfm

Cs = (Wt X 15.43)/VmStd
Cs = (.0265 X 15.43)/ 45.55221
Cs = 0.0090 grains/scf

PMRc = (Cs X QsStd X 60)/7000
PMRc = (8.976404E-03 X 31566.5 X 60)/7000
PMRc = 2.4287 pounds/hour

PMRa = (Wt X As)/(Time:Hours X An X 454)
PMRa = (.0265 X 17.176)/(1.2 X .000341 X 454)
PMRa = 2.4501 pounds/hour

I = (PMRa/PMRc) X 100
I = (2.450058 / 2.428746) X 100
I = 100.88 %

Isokinetic Rate = (VmStd X As)/(An X Minutes X QsStd) X 100
Isokinetic Rate = (45.55221 X 17.176)/(.000341 X 72 X 31566.5) X 100
Isokinetic Rate = 100.95 %

Appl. No.=91040073
Vl=57.8
Y=1.012
Vm=46.63
Tl=76.6
Pb=29.23
DH=1.663
Cp=.84
T2=554.5
Ps=29.23
DP=0.8042
CO2=1.6
O2=19.0
CO=0
As=17.176
Wt=0.0265
An=.000341
Time: Minutes=72
Time:Hours=1.2
Btu=1
FO=1

FLSPART

Company Name: Meyer Steel Drum

Location: Chicago

Test Number: 3

Test Date: 12/12/91

Source: Drum Reclamation Process Controlled by an Afterburner

Identification Number: 031 600 APY

Application Number: 91040073

PARTICULATE MATTER TEST
Concentration & Pollutant Mass Rate

Vwc = Vl x 0.04707
Vwc = 54.3 x 0.04707
Vwc = 2.56 scf

VmStd = Y X Vm X (TsStd/Tm) X (Pb + DH/13.6)/PsStd
VmStd = 1.012 X 37.87 X (528/ 541.3) X (29.23 + 1.694 /13.6)/29.92
VmStd = 36.68 scf

Bwo = Vwc/VmStd +Vwc
Bwo = 2.555901 / 36.67631 + 2.555901
BWO = 0.0651
% H2O = 6.51
1-Bwo = 0.9349

Ms = Md(1-Bwo) + 18(Bwo)
Ms = 29.072 (.934852) + 18(6.514803E-02)
Ms = 28.35

Vs = 85.48 X Cp X (Ts/Ps X Ms) Sq Rt X Dp
Vs = 85.48 X .84 X (1018.6 /(29.23 X 28.35068)) Sq Rt X .8141
Vs = 64.81 feet per second

Qs = As X Vs X 60
Qs = 17.276 X 64.80779 X 60
Qs = 67177 acfm

QsStd = Qs X (Ps/PsStd) X (TsStd/Ts) X (1-Bwo)
QsStd = 67177.16 X (29.23 /29.92) X (529/ 1018.6) X (1- 6.514803E-02)
QsStd = 31803 scfm

Cs = (Wt X 15.43)/VmStd
Cs = (.0281 X 15.43)/ 36.67631
Cs = 0.0118 grains/scf

PMRc = (Cs X QsStd X 60)/7000
PMRc = (1.182188E-02 X 31802.55 X 60)/7000
PMRc = 3.2226 pounds/hour

PMRa = (Wt X As)/(Time:Hours X An X 454)
PMRa = (.0281 X 17.276)/(.95833 X .000341 X 454)
PMRa = 3.2721 pounds/hour

I = (PMRa/PMRc) X 100
I = (3.272082 / 3.222566) X 100
I = 101.54 %

Isokinetic Rate = (VmStd X As)/(An X Minutes X QsStd) X 100
Isokinetic Rate = (36.67631 X 17.276)/(.000341 X 57.5 X 31802.55
) X 100
Isokinetic Rate = 101.61 %

Y=1.012
Vm=37.87
T1=81.3
Pb=29.23
DH=1.694
Cp=.84
T2=558.6
Ps=29.23
DP=0.8141
CO2=2.1
O2=18.4
CO=0
As=17.276
Wt=0,0281
?Redo from start
Wt=0.0281
An=.000341
Time: Minutes=57.5
Time:Hours=0.95833
Btu=1

FLSPART

Company Name: Meyer Steel Drum

Location: Chicago

Test Number: 4

Test Date: 12/12/91

Source: Drum Reclamation Process Controlled by an Afterburner

Identification Number: 031 600 APY

Application Number: 91040073

PARTICULATE MATTER TEST
Concentration & Pollutant Mass Rate

Vwc = Vl x 0.04707
Vwc = 49.6 x 0.04707
Vwc = 2.33 scf

VmStd = Y X Vm X (TsStd/Tm) X (Pb + DH/13.6)/PsStd
VmStd = 1.102 X 38.631 X (528/ 527.7) X (29.35556 + 1.634 /13.6)/29.92
VmStd = 41.96 scf

Bwo = Vwc/VmStd +Vwc
Bwo = 2.334672 / 41.96304 + 2.334672
BWO = 0.0527
% H2O = 5.27
1-Bwo = 0.9473

Ms = Md(1-Bwo) + 18(Bwo)
Ms = 29.04 (.9472959) + 18(5.270413E-02)
Ms = 28.46

Vs = 85.48 X Cp X (Ts/Ps X Ms) Sq Rt X Dp
Vs = 85.48 X .84 X (1001.3 /(29.35 X 28.45815)) Sq Rt X .7969
Vs = 62.65 feet per second

Qs = As X Vs X 60
Qs = 17.276 X 62.65019 X 60
Qs = 64941 acfm

QsStd = Qs X (Ps/PsStd) X (TsStd/Ts) X (1-Bwo)
QsStd = 64940.67 X (29.35 /29.92) X (529/ 1001.3) X (1- 5.270413E-02)
QsStd = 31821 scfm

Cs = (Wt X 15.43)/VmStd
Cs = (.0262 X 15.43)/ 41.96304
Cs = 0.0096 grains/scf

PMRc = (Cs X QsStd X 60)/7000
PMRc = (9.633859E-03 X 31821.35 X 60)/7000
PMRc = 2.6277 pounds/hour

PMRa = (Wt X As)/(Time:Hours X An X 454)
PMRa = (.0262 X 17.276)/(1 X .000341 X 454)
PMRa = 2.9237 pounds/hour

I = (PMRa/PMRc) X 100
I = (2.92371 / 2.627678) X 100
I = 111.27 %

Isokinetic Rate = (VmStd X As)/(An X Minutes X QsStd) X 100
Isokinetic Rate = (41.96304 X 17.276)/(.000341 X 60 X 31821.35) X 100
Isokinetic Rate = 111.35 %

Y=1.102
Vm=38.631
T1=67.7
Pb=29.355555
DH=1.634
Cp=.84
T2=541.3
Ps=29.35
DP=0,7969
?Redo from start
DP=0.7969
CO2=1.9
O2=18.4
CO=0
As=17.276
Wt=0.0262
An=.000341
Time: Minutes=60
Time:Hours=1.0
Btu=1
FO=1